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(71) Applicant(s)

**Downhole Products (UK) Limited**

**(Incorporated in the United Kingdom)**

**144 North Deeside Road, Peterculter, ABEDEEN,  
AB1 0UD, United Kingdom**

(72) Inventor(s)

**William Barron**

**Ian Alistair Kirk**

**Alistair Bertram Clark**

(74) Agent and/or Address for Service

**Murgitroyd & Company**

**373 Scotland Street, GLASGOW, G5 8QA,  
United Kingdom**

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(56) Documents Cited

**GB 2282615 A**

**GB 2249333 A**

**GB 0682362 A**

**US 4984633 A**

(58) Field of Search

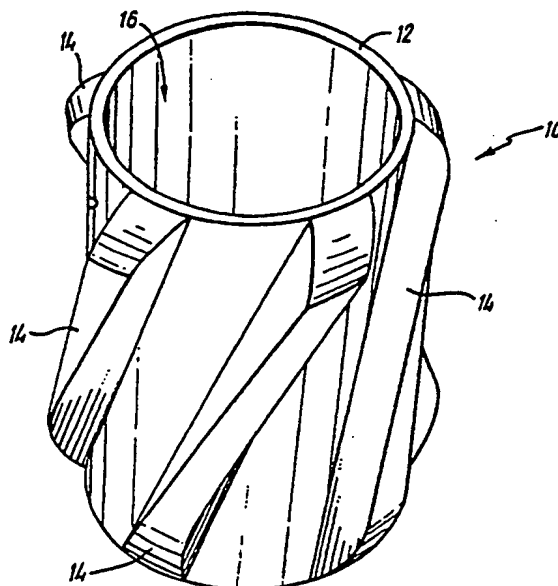
**UK CL (Edition N ) E1F FAC**

**INT CL<sup>6</sup> E21B**

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## (54) Casing centraliser

(57) A casing centraliser (10) includes an annular body (12) and a substantially cylindrical bore (16) extending longitudinally through the body (12). A number of blades (14) extend longitudinally along the body (12) and are circumferentially distributed around the body (12) to define a flow path between each adjacent pair of blades (14). Each flow path provides a fluid flow path between longitudinally opposite ends of the centraliser (10) and each blade (14) has a radially outer edge providing a well bore contacting surface. The cylindrical bore (16) through the body (12) is a clearance fit around casing intended to be centralised by the centraliser (10). The centraliser (10) is typically manufactured from a material which includes zinc and is preferably a zinc alloy. The centraliser is positioned on the casing by a pair of stop collars (not shown).



**FIG. 1**

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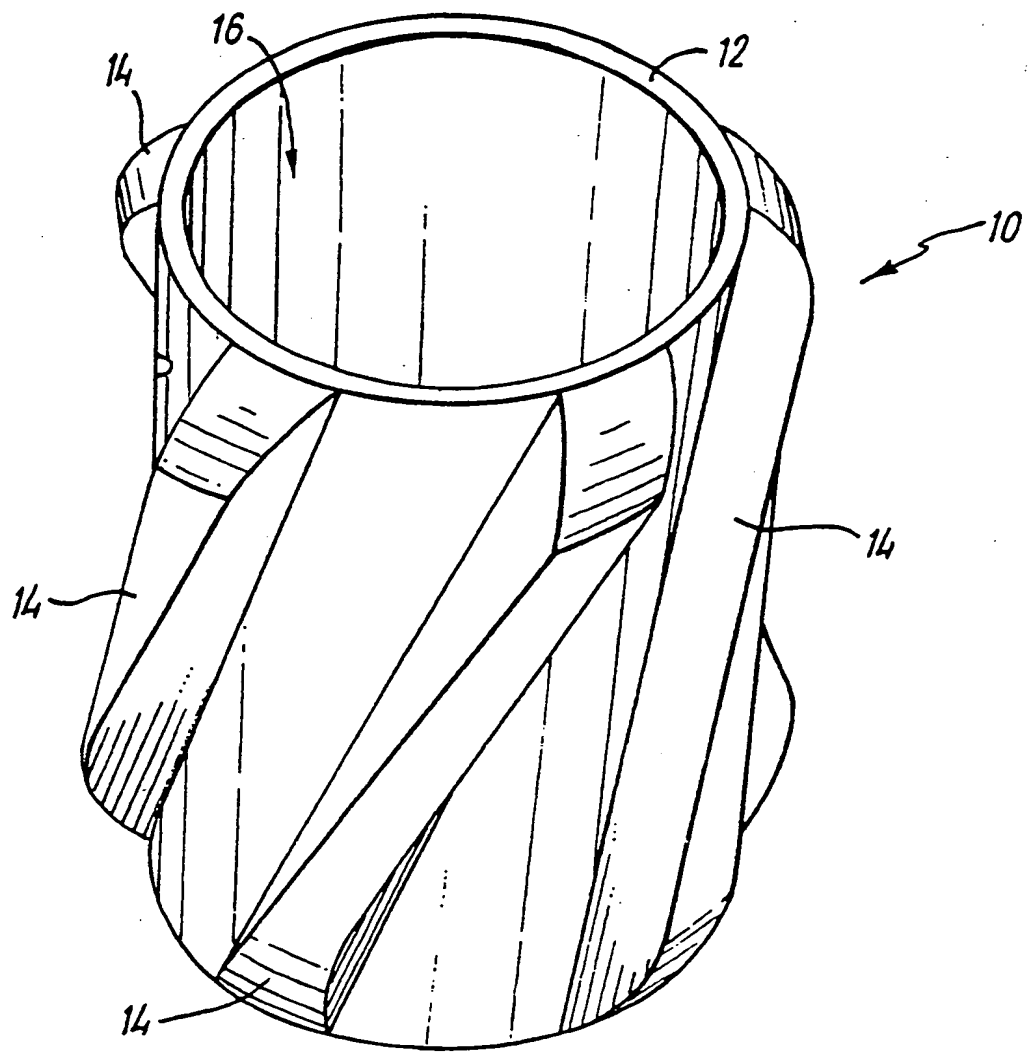
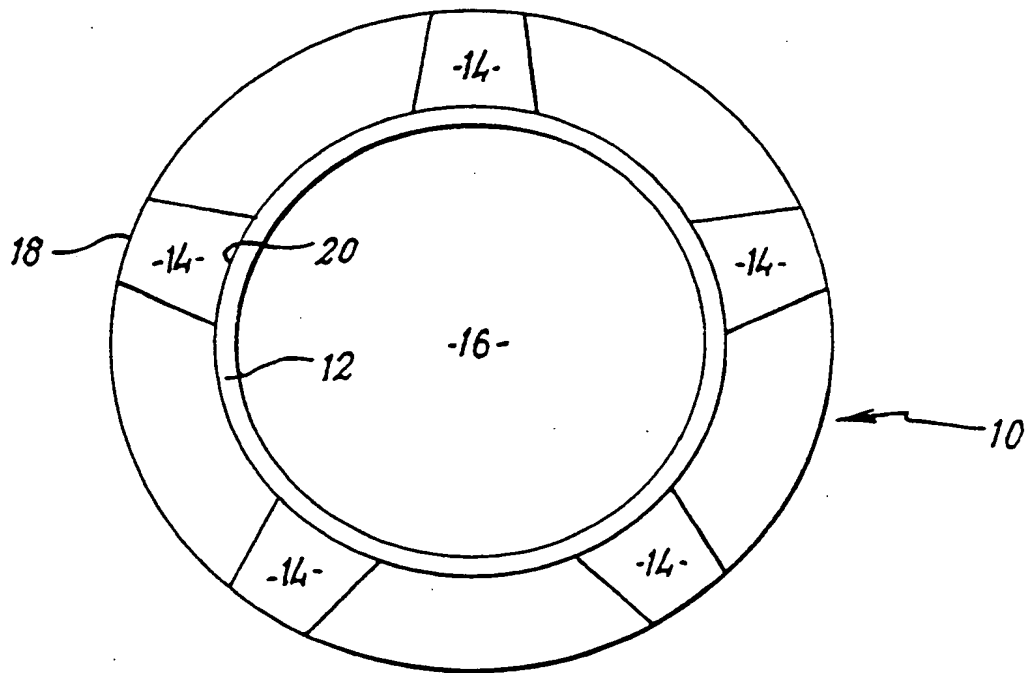
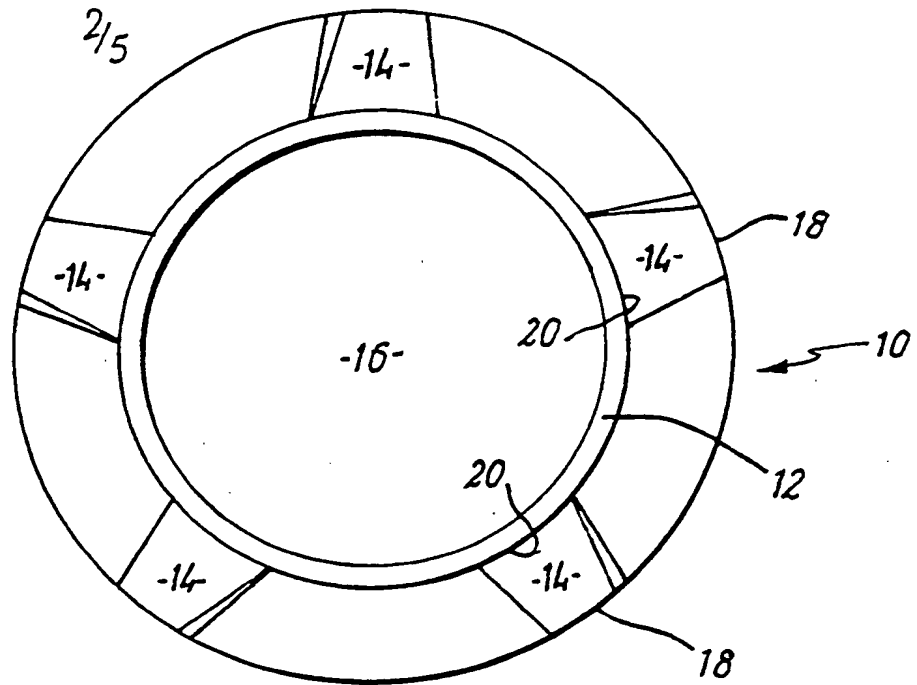


FIG. 1



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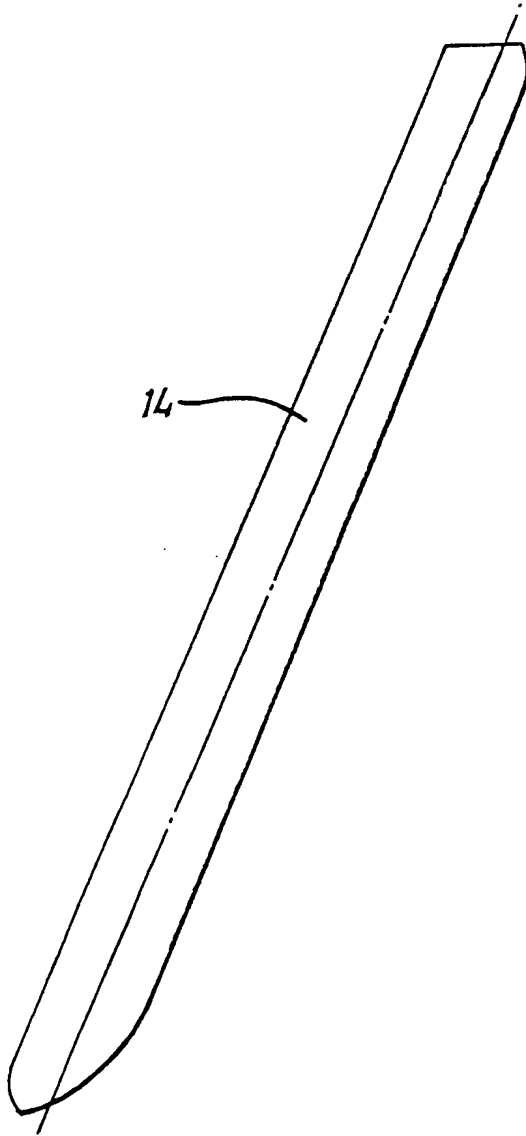


FIG. 4

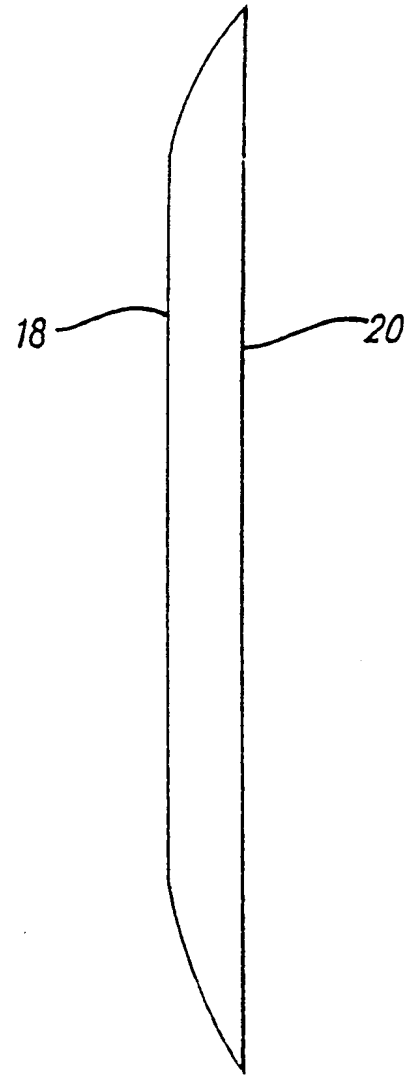
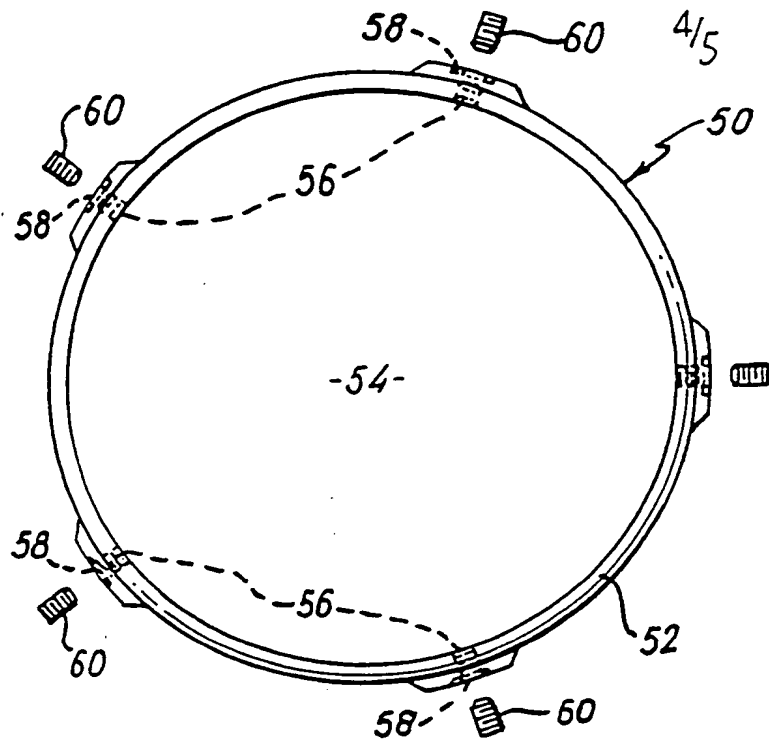
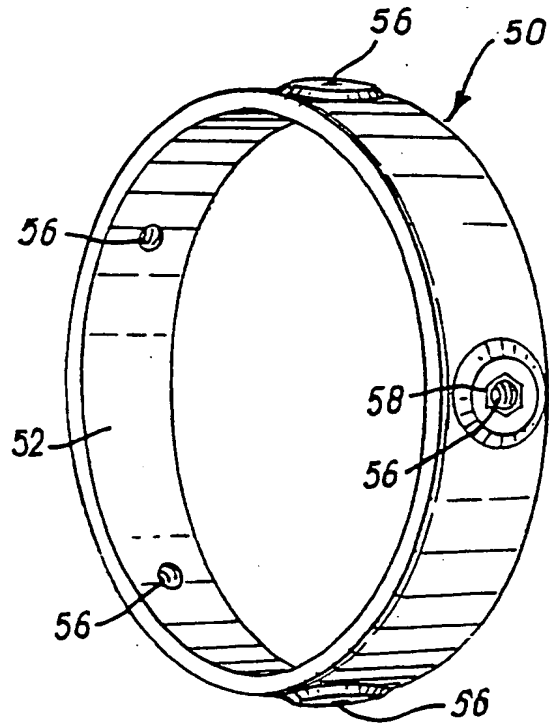


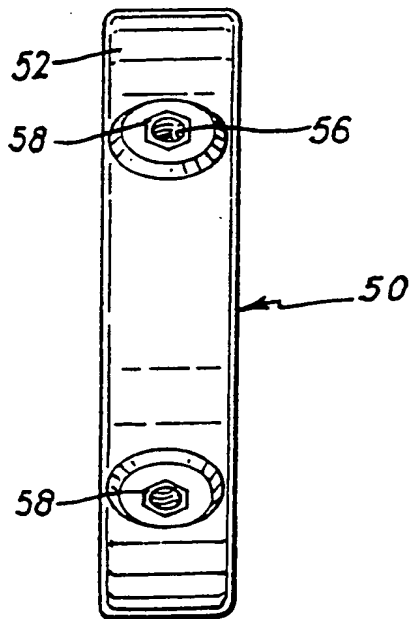
FIG. 5



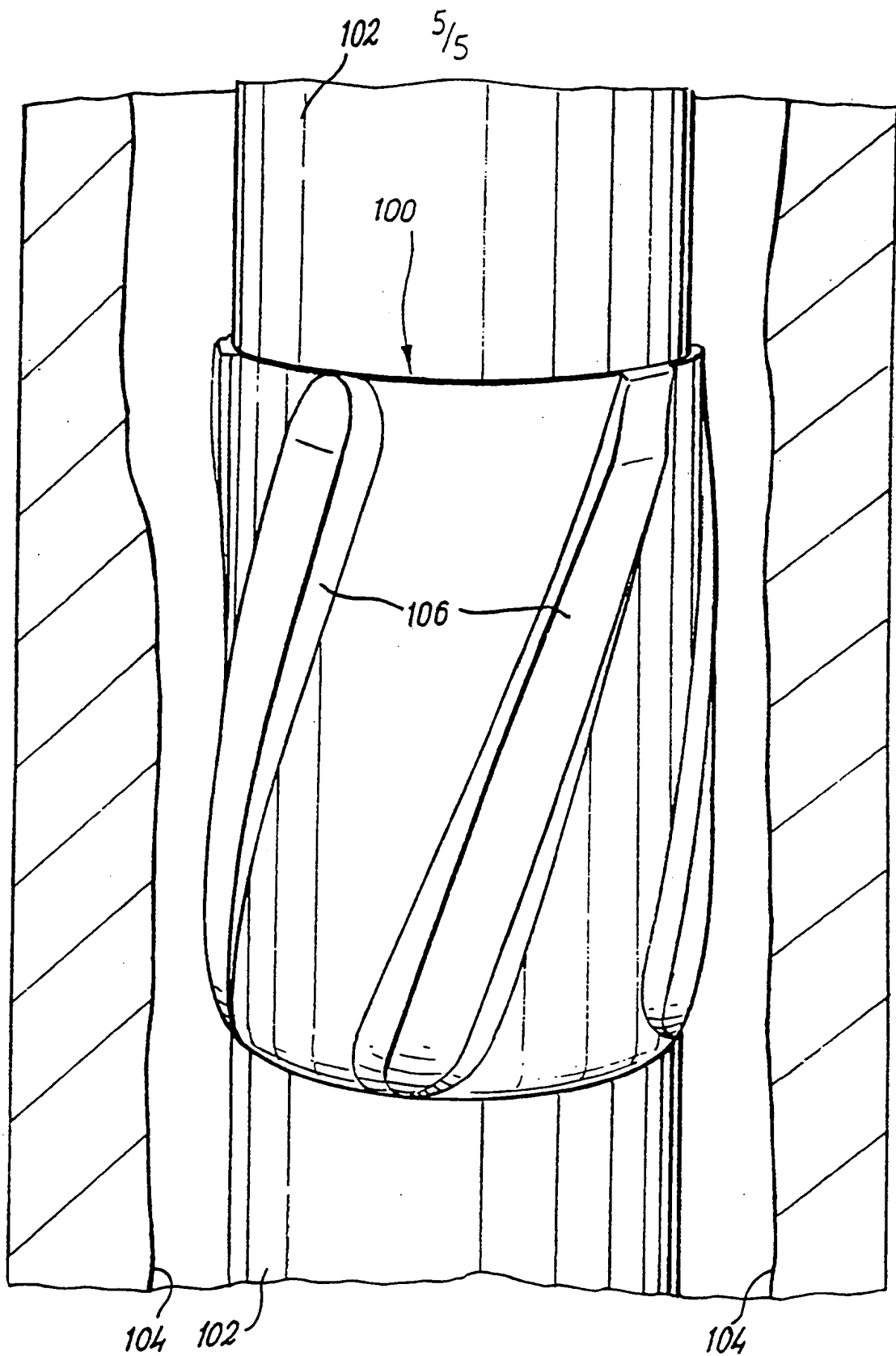
**FIG. 6**



**FIG. 7**



**FIG. 8**



**FIG. 9**

1     "CASING CENTRALISER"

2  
3     This invention relates to a casing centraliser and  
4     relates more particularly but not exclusively to a  
5     casing centraliser for facilitating the cementing of  
6     casing in a well.

7  
8     When a well has been drilled for the eventual  
9     production of hydrocarbons, one of the procedures  
10    commonly employed in readying the well for production  
11    comprises emplacing a hollow tubular casing in the  
12    well, and filling the space between the exterior of the  
13    casing and the well bore with cement, principally as a  
14    sealant and also as a mechanical support for the  
15    casing. Since it is desirable that the casing be  
16    centralized in the well bore when cemented, proposals  
17    have been made for providing the casing (prior to  
18    cementing) with externally mounted centralisers to hold  
19    the casing away from the well bore and towards the  
20    centre of the bore.

21  
22    According to a first aspect of the present invention  
23    there is provided a casing centraliser comprising an

1 annular body, a substantially cylindrical bore  
2 extending longitudinally through said body, and a  
3 peripheral array of a plurality of longitudinally  
4 extending blades circumferentially distributed around  
5 said body to define a flow path between each  
6 circumferentially adjacent pair of said blades, each  
7 said flow path providing a fluid flow path between  
8 longitudinally opposite ends of said centraliser, each  
9 said blade having a radially outer edge providing a  
10 well bore-contacting surface, and said cylindrical bore  
11 through said body being a clearance fit around tubular  
12 casing intended to be centralised by said casing  
13 centraliser.

14  
15 Said centraliser is preferably free of any means  
16 tightly gripping a casing when said centraliser is  
17 installed thereon, whereby said centraliser and said  
18 casing are mutually rotatable.

19  
20 Said centraliser may be formed of a zinc alloy, which  
21 alloy is preferably one of the "ZA" range of zinc  
22 alloys supplied by Brock Alloys (GB).

23  
24 Said blades are preferably mutually substantially  
25 equidistantly distributed around said body. Said blades  
26 preferably each extend circumferentially at least  
27 part-way around said body between longitudinally  
28 opposite ends thereof to provide a circumferential  
29 distribution of each said well bore-contacting surface.  
30 Each said blade preferably has a radially inner root  
31 integral with said body, each said radially inner root  
32 preferably being circumferentially wider than the  
33 respective radially outer edge. Said blades are  
34 preferably circumferentially wider at one end of the  
35 centraliser than at the other end, said one end

1 preferably the lower end of the centraliser in use  
2 thereof. Said centraliser preferably has five of said  
3 blades.

4  
5 Longitudinally opposite ends of said blades and/or of  
6 said body may be chamfered or tapered whereby to  
7 facilitate passage of said centraliser down a well  
8 bore.

9  
10 According to a second aspect of the present invention  
11 there is provided a centraliser stop collar for  
12 longitudinally restraining a casing centraliser  
13 according to the first aspect of the present invention  
14 when installed upon casing, said stop collar comprising  
15 a ring having a substantially cylindrical bore  
16 extending longitudinally therethrough, said bore being  
17 dimensioned to fit around said casing, said ring having  
18 longitudinal lock means for longitudinally locking said  
19 collar to said casing.

20  
21 Said lock means preferably comprises one or more  
22 internally threaded bores extending radially through  
23 said ring, and a screw-threaded fastener in each said  
24 internally threaded bore, each said fastener being  
25 screwable into collar-locking contact with said casing.

26  
27 Said ring may be formed of a zinc alloy which is  
28 preferably the same alloy as that of which the  
29 centraliser is formed. Each said internally threaded  
30 bore may be defined by an initially separate thread  
31 insert forming an integral part of said collar when  
32 fabricated, for example by being cast into the ring,  
33 and said thread inserts may be formed of materials  
34 which are substantially different from that of the  
35 ring, eg of brass or steel as compared to a zinc alloy.

1 According to a third aspect of the present invention  
2 there is provided a combination of hollow tubular well  
3 casing and at least one casing centraliser according to  
4 the first aspect of the present invention fitted on  
5 said casing, preferably to be rotatable thereon.

6  
7 The or each said centraliser may be longitudinally  
8 restrained by a respective stop collar according to the  
9 second aspect of the present invention and installed  
10 upon said casing at or adjacent one end of the  
11 respective centraliser. One or more of said  
12 centralisers may be longitudinally restrained by a  
13 respective pair of stop collars according to the second  
14 aspect of the present invention, one of said pair of  
15 stop collars being installed upon said casing at or  
16 adjacent each longitudinally opposite end of the  
17 respective centraliser.

18  
19 According to a fourth aspect of the present invention  
20 there is provided a method of cementing a hollow  
21 tubular well casing into a well bore, said method  
22 comprising the step of fitting said casing with at  
23 least one centraliser according to the first aspect of  
24 the present invention to form a combination in  
25 accordance with the third aspect of the present  
26 invention, together with a necessary or desirable  
27 number of stop collars in accordance with the second  
28 aspect of the present invention, locating said  
29 combination in said well bore such that the or each  
30 said centraliser provides at least a  
31 casing-centralising function for said casing within  
32 said well bore and pumping cement into voids between  
33 the exterior of said casing and the bore of the said  
34 well.

35

1     Embodiments of the invention will now be described by  
2     way of example, with reference to the accompanying  
3     drawings wherein:-

4  
5         Fig. 1 is a perspective view from above and to one  
6         side of a first embodiment of casing centraliser  
7         in accordance with the first aspect of the present  
8         invention;

9         Fig. 2 is a plan view from above of the first  
10        embodiment;

11       Fig. 3 is an underneath view of the first  
12       embodiment;

13       Fig. 4 and 5 are respectively radial (plan) and  
14       circumferential (side) views of a blade forming  
15       part of the first embodiment;

16       Fig. 6, 7 and 8 are respectively plan, perspective  
17       and side views of a casing stop collar in  
18       accordance with the second aspect of the present  
19       invention, and suitable for use in conjunction  
20       with the first aspect of the present invention;  
21       and

22       Fig. 9 is a perspective view of a combination in  
23       accordance with the third aspect of the present  
24       invention.

25  
26     Referring first to Figs. 1-3, a casing centraliser 10  
27     in accordance with the present invention is a unitary  
28     annulus comprising a generally cylindrical body 12, and  
29     an array of five equiangularly-spaced blades 14  
30     integrally formed with the body 12. A cylindrical bore  
31     16 extends longitudinally and coaxially through the  
32     body 12, the bore 16 having a substantially uniform  
33     diameter dimensioned to be a clearance fit around the  
34     well bore casing (not shown in Fig.1-8).

35

1 Each of the blades 14 (see also Figs.4&5) not only  
2 extends between longitudinally opposite ends of the  
3 body 12, but also extends circumferentially part-way  
4 around the periphery of the centraliser 10. The  
5 skewing of the blade 14 ensures that their respective  
6 radially outer edges 18 collectively provide a  
7 circumferentially substantially uniform well bore-  
8 contacting surface for the centraliser 10, as most  
9 particularly shown in Figs.2 and 3.

10  
11 Each of the blades 14 has a respective radially inner  
12 root 20 integral with the body 12. In each of the  
13 blades 14, the root 20 has a greater circumferential  
14 width than the outer edge 18, ie the cross-section of  
15 each blade 14 tapers towards the well bore-contacting  
16 periphery of the centraliser 10. The individual and  
17 collective shapes of the blades 14, and of the  
18 longitudinal fluid flow passages defined between  
19 adjacent pairs of the blades 14, gives the centraliser  
20 10 improved flow characteristics and minimises the  
21 build-up of trapped solids during use of the  
22 centraliser 10.

23  
24 Longitudinally opposite ends of the blades 14, and of  
25 the body 12, are chamfered to assist in movement of the  
26 centraliser 10 up/down a well bore.

27  
28 Although the blades 14 are shown separately from the  
29 body 12 in Figs 4 and 5 (and while the blades 4 could  
30 be separately formed and subsequently attached to the  
31 body 12 by any suitable means) it is preferred that the  
32 entire centraliser 10 be fabricated as a one-piece  
33 article, preferably by being precision cast in a  
34 suitable metal or alloy.

35

1 A preferred material for forming the centraliser 10 is  
2 a zinc alloy, most preferably one of the "ZA" range of  
3 zinc alloys supplied by the Brock Alloys Company of the  
4 United Kingdom. Use of a zinc alloy in general, and of  
5 one of the "ZA" alloys in particular gives a number of  
6 advantages; the zinc alloy is non-sparking (ie sparks  
7 are not generated if the centraliser 10 collides with  
8 steel), the zinc alloy provides superior bearing  
9 properties, exceptional resistance to wear and  
10 abrasion, excellent strength and hardness, and the zinc  
11 component of the alloy offers cathodic protection to  
12 the casing around which the centraliser 10 is located.  
13

14 Since the bore 16 is a clearance fit around the casing  
15 and since the bore 16 lacks any means of tightly  
16 gripping a normally dimensioned casing, the centraliser  
17 10 can not only rotate freely around the casing but  
18 also move freely along the casing (unless and until the  
19 centraliser collides with an obstruction, for example a  
20 protruding casing joint). Thus to provide longitudinal  
21 restraint for the centraliser 10 to retain the  
22 centraliser substantially at its preferred location  
23 along the casing but without impairing the relative  
24 rotatability of centraliser and casing, use is made of  
25 a stop collar 50 as illustrated in Figs. 6, 7 and 8 to  
26 which reference will now be made.  
27

28 The stop collar 50 comprises an undivided ring 52  
29 having a bore 54 about equal in diameter to the bore 16  
30 in order to fit alongside the centraliser 10 on the  
31 same casing. The ring 52 is radially penetrated by  
32 five internally threaded holes 56. The ring 52 is cast  
33 of the same zinc alloy as the centraliser 10, and five  
34 thread inserts 58 are either cast into the ring 52 to  
35 form the threaded holes 56, or subsequently screwed

1 into or pressed into a previously cast ring.

2

3 In use of the stop collar 50, the ring 52 is fitted  
4 around the casing in correct relationship to the  
5 intended location of a centraliser. A grub screw 60 is  
6 then screwed down each of the threaded holes 56 to  
7 tighten against the underlying casing (not shown in  
8 Figs.6-8) so as to lock the collar 50 onto the casing.

9

10 The locked-on collar 50 then provides an abutment which  
11 stops longitudinal movement of the centraliser in one  
12 direction while not inhibiting free relative rotation  
13 of the centraliser and the casing. While a single stop  
14 collar would normally be located under a centraliser on  
15 vertical or near-vertical casing to prevent  
16 unrestricted dropping of the centraliser down the  
17 casing, circumstances may dictate that a stop collar be  
18 located above a centraliser, or that a respective stop  
19 collar be used at each end of a centraliser.

20

21 Fig. 9 shows a modified form of casing centraliser 100,  
22 fitted around hollow tubular casing 102 which is  
23 located within a well bore 104. The modified  
24 centraliser 100 is essentially the same as the  
25 centraliser 10 described above, and differs principally  
26 in the dimensions and proportions of its blades 106.  
27 In particular, the blades 106 are circumferentially  
28 wider at the lower end of the centraliser 100 than they  
29 are at the upper end. Fig.9 also illustrates the  
30 manner in which the centraliser will hold casing out of  
31 direct contact with the well bore and centrally within  
32 the well bore, in preparation for subsequent cementing.

33

34 In the case of casing located within larger diameter  
35 casing, centralisers can be employed on the inner

1 casing to hold it out of direct contact with the outer  
2 casing.

3  
4 Centralisers in accordance with the invention can also  
5 be employed on drillstrings as rotary stabilisers.

6  
7 While certain preferred embodiments of the invention  
8 have been described above, the invention is not  
9 restricted thereto, and modifications and variations  
10 thereof can be adopted without departing from the scope  
11 of the invention.  
12

1     CLAIMS

2  
3     1.    A casing centraliser comprising an annular body, a  
4     substantially cylindrical bore extending longitudinally  
5     through the body, the annular body being manufactured  
6     from a material comprising zinc, and a cylindrical bore  
7     through the body, the bore being a clearance fit around  
8     tubular casing intended to be centralised by the casing  
9     centraliser.

10  
11    2.    A centraliser according to Claim 1, further  
12    comprising a peripheral array of a plurality of  
13    longitudinally extending blades circumferentially  
14    distributed around said body to define a flow path  
15    between each circumferentially adjacent pair of said  
16    blades, each said flow path providing a fluid flow path  
17    between longitudinally opposite ends of said  
18    centraliser, each said blade having a radially outer  
19    edge providing a well bore-contacting surface.

20  
21    3.    A casing centraliser comprising an annular body, a  
22    substantially cylindrical bore extending longitudinally  
23    through said body, and a peripheral array of a  
24    plurality of longitudinally extending blades  
25    circumferentially distributed around said body to  
26    define a flow path between each circumferentially  
27    adjacent pair of said blades, each said flow path  
28    providing a fluid flow path between longitudinally  
29    opposite ends of said centraliser, each said blade  
30    having a radially outer edge providing a well bore-  
31    contacting surface, and said cylindrical bore through  
32    said body being a clearance fit around tubular casing  
33    intended to be centralised by said casing centraliser.

34  
35    4.    Apparatus according to Claim 3, wherein the

1 centraliser is manufactured from a material which  
2 comprises zinc.

3

4 5. A centraliser according to any of Claims 1, 2 or  
5 4, wherein the material is a zinc alloy.

6

7 6. A casing centraliser according to any of Claims 2  
8 to 5, wherein the blades are substantially  
9 equidistantly distributed around the body.

10

11 7. A casing centraliser according to any of Claims 2  
12 to 6, wherein the blades circumferentially extend at  
13 least part way around the body between longitudinally  
14 opposite ends of the blades.

15

16 8. A casing centraliser according to any of Claims 2  
17 to 7, wherein each blade includes a radially inner  
18 route integral with the body, each radially inner route  
19 being circumferentially wider than the respective  
20 radial outer edge of the blade.

21

22 9. A casing centraliser according to any of Claims 2  
23 to 8, wherein each of the blades are circumferentially  
24 wider at one end of the centraliser than at the other  
25 end.

26

27 10. A casing centraliser according to any of Claims 2  
28 to 9, wherein five blades are provided on the body.

**Relevant Technical Fields**

(i) UK Cl (Ed.N) E1F (FAC)

(ii) Int Cl (Ed.6) E21B

**Databases (see below)**

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI

Search Examiner  
MR D J HARRISON

Date of completion of Search  
27 APRIL 1995

Documents considered relevant  
following a search in respect of  
Claims :-  
1, 2, 4-10

**Categories of documents**

- X:** Document indicating lack of novelty or of inventive step.      **P:** Document published on or after the declared priority date but before the filing date of the present application.
- Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category.      **E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.
- A:** Document indicating technological background and/or state of the art.      **&:** Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
A,E	GB 2282615 A	(UWG LIMITED) 12 APRIL 1995 see especially page 2 lines 7-20	1
A	GB 2249333 A	(EXXON PRODUCTION RESEARCH COMPANY) whole document	1
A	GB 682362	(BAKER OIL TOOLS INC) whole document	1
A	US 4984633	(LANGER ET AL) whole document	1